

The Maryland Fruit Grower



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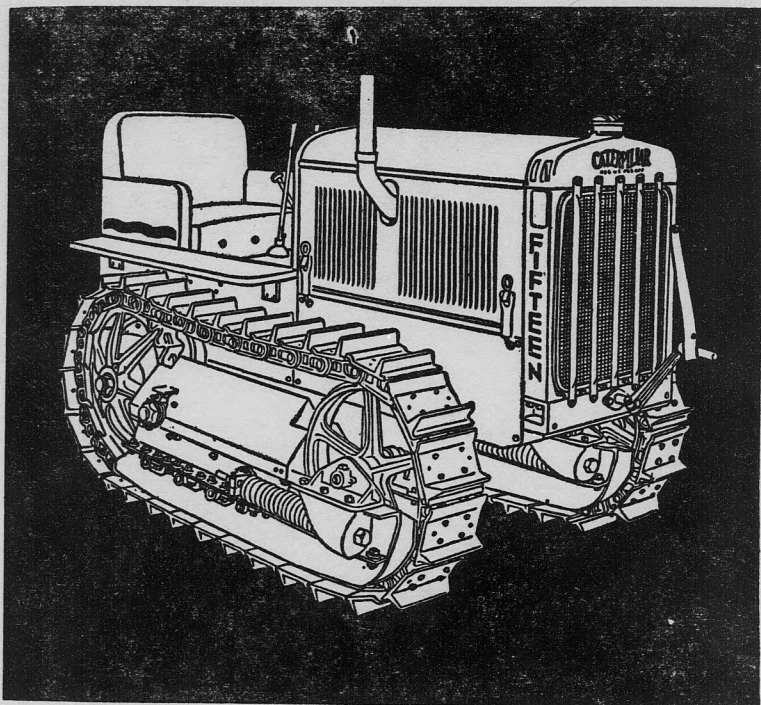
By

THE MARYLAND STATE HORTICULTURAL SOCIETY
College Park, Maryland

Volume 1

March, 1931

Number 2



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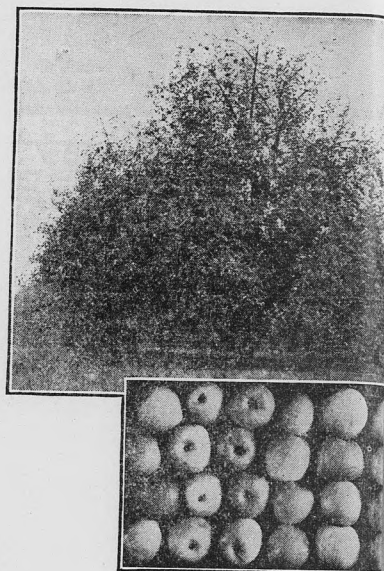
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The Improved Dormant Spray

1. 98.6% ACTIVE ingredients!
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DENDROL and VERDOL are the result of several years of intensive and exhaustive research conducted with the co-operation of the CROP PROTECTION INSTITUTE. Complete information is given in DENDROL and VERDOL booklets. Write for your free copy.

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High-nitrogen fertilizer produces the quality fruit like these that bring top-prices and top-profits.

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AN ORCHARD PROGRAM

The present soil moisture deficiency in orchards calls for the saving of moisture and the use of orchard practices that will use all available moisture to best advantage. The Department of Horticulture, University of Maryland, recommends the following:

1. Prune out weak, crowded branches and thick parts in the tree.
2. Cultivate early to turn under organic matter and to conserve soil moisture.
3. Apply nitrogen fertilizer about three weeks before buds swell.
4. Provide bees for good pollination.
5. Thin fruit, removing crowded and blemished fruits.
6. Sow cover crop early—about June 15th if possible—and use a little fertilizer on the cover crop.

THE FRUIT OUTLOOK

APPLES—The 1931 apple outlook, published by the U. S. Bureau of Agricultural Economics (Misc. Publication No. 108, U. S. D. A.), shows almost 25 per cent of trees in commercial orchards not yet of bearing age, and 60 per cent under 20 years of age. Present production will be maintained for some years, and may even increase. Competition among apple growers, and also with growers of other fruits, will continue. New planting should be done cautiously and only as replacements or on good soil, favorably located. Varieties and pollination should be carefully considered.

The Northwest has about reached the peak of production, in the present cycle. In 1928, only 13 per cent of the trees in Washington, Oregon, Idaho, and California were under 9 years of age. Light plantings, mostly of Delicious, have been made since that time.

In 1928 the barrel-apple states showed about one-third of the trees in commercial orchards to be under 9 years of age. Only moderate plantings have been made since that time. The present production probably will be maintained or even increased should prices be encouraging.

Delicious, McIntosh, Stayman, Winesap, Jonathan, and Grimes show heaviest recent plantings. York has been moderately planted and Ben Davis plantings have decreased.

The export trade has been heavy, and the outlook indicates fairly good demand for better grades of apples in the future. Domestic supplies of apples and competing fruits are heavier than a year ago, and cold storage holdings of apples are 20 per cent greater than at this time a year ago.

PEACHES—The peak of peach production in the South was reached in 1928. The 1929 survey showed 18 per cent of the Southern trees to be under 5 years of age, and 65 per cent from 5 to 9 years old. These trees will soon decline in potential productivity. Winter-killing is causing damage. Estimated annual replants of 5 per cent of the present total commercial trees do not promise to maintain present acreage of trees.

Figures from North Carolina and Tennessee indicate low percentages of young trees, and a decline of potential production in a few years. Arkansas may maintain present acreage by new plantings.

The North Atlantic States indicate only moderate changes in bearing acreage. New Jersey and New York show a slight decrease. The Shenandoah-Cumberland section probably will maintain present acreage. Illinois, a leading peach state, evidently has reached peak of production from trees now planted. A net loss of about 8 per cent of trees occurred during 1930. No great change in production is expected in Michigan, or in the California canning peach crop. Colorado and Utah promise some increase in bearing acreage.

GRAPES—Increase in grape acreage is not recommended.

STRAWBERRIES—Strawberry acreage in the intermediate states (including Maryland) has decreased, and due to poor stands of plants, the drought and other factors, a moderate increase in planting, and the renovation of fields for the 1932 crop seems advisable.

A complete Agricultural Outlook for 1931 will be released in the near future by the University of Maryland Extension Service.

Where to get Bees for Pollination

PETTITS PACKAGE BEES supply known quantities of working bees when and where you want them. Wintered hives may or may not be this.

MORLEY PETTIT was at one time Provincial Apiarist of Ontario. He is now producing Honey in Ontario and Package Bees in Georgia.

By a study of fruit growers' pollination problems he has developed a telegraphic SERVICE by which the grower who orders in advance gets all the bees he wants just when he wants them.

Large swarms of bees, shipped in light combless packages by fast express direct from the South arrive just in time for the blossoms.

Government experts as well as extensive growers have used this Service and found it GOOD.

Pettits Five Pound Orchard Package contains full five pounds of Italian Bees and a good young Italian Queen, and does more than twice as much work on blossoms as a three pound size.

This swarm may be transferred to regular equipment, or the package may be wrapped and used as a hive by any careful person, without beekeeping experience.

Five hundred of these Orchard Packages were sold in 1930 to growers all through the North. Orders already booked indicate that this business will be doubled for 1931.

This shows how they are catching on the giving service.

Young Bees without Queens are also sold to strengthen weak colonies, and smaller packages with Queens for honey producers.

For Prices and Full Particulars write to

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BEES FOR FRUIT POLLINATION

By A. E. Murneek, Department of Horticulture, University of Missouri.

Most fruit growers know that, weather permitting, vast numbers of insects visit flowers of fruit trees. While thus diligently collecting nectar for the making of honey, the hairy bodies of these insects become covered with the minute pollen grains, which are then transferred from blossom to blossom and from one variety to another. Thereby pollination is accomplished, which is necessary for the production of practically all of our fruits. Wind is an almost negligible agent in the scattering of pollen of fruit producing plants.

The Value of Bees

Of the various kinds of insects that visit flowers early in the spring, the common honey bee is by far in the majority. Moreover, it has been actually demonstrated in a convincing way that bees are of great value for the pollination of apples, sour cherries and many other fruits. This is particularly true in sections where most of the ground has been put under cultivation with very little waste land left to harbor wild insects. Bees are artificially protected during the winter and will begin to fly in large numbers early in the spring when few other insects are present. Then, too, the honey bee is the only insect that is under our control and that can be moved to an orchard, if so desired.

The activities of bees are especially well adapted for fruit pollination. They visit largely, if not exclusively, flowers of only one kind of fruit at a time, like the apple or the peach. They do not scatter in their flight over an extensive area, but confine their activities to a certain place, even part of an orchard. Hence, the importance of having bees on one's own premises and the necessity of interplanting several varieties in an orchard, particularly of fruits that are mostly self-sterile, like the apple. This phase of the subject has been discussed more fully elsewhere in these proceedings. If, during the time of flowering, bees are not present in any quantity in the orchard, then the yield of fruits will be small. Flowers that are not pollinated and fertilized will drop soon after blossoming or else will develop into fruits which fall off while still small.

Effects of Weather

The domesticated honey bees cannot fly when the temperature is rather low. They are easily susceptible to chilling. They will not leave the hive in any large numbers if the outside temperature is 58°F. or lower. Free flying will begin at a temperature of 65°F. or higher. By watching bees at the entrance of a hive one will be convinced that these statements are generally true. The honey bee is likewise sensitive to atmospheric humidity. If the day is cloudy and the air is damp, or rain is in the offing, bees will remain within the hive. The few that may venture for a short visit to nearby trees will return promptly. Wind also greatly retards the flying of bees. One that is blowing at the rate of 20 to 25

miles an hour will prevent bees from visiting flowers even on a sunny day, and those that will fly seek the lee or protected side of the tree.

Unfortunately, in the Central States, and to some degree elsewhere, the weather undergoes great fluctuations during the period of the year when fruit trees are in bloom. Hot and cold spells, rainy and bright days may follow each other in rapid succession. Consequently there is a great deal of uncertainty in the way bees may affect pollination and fruit setting. The spring of 1927, for instance, was marked by extremely unfavorable weather conditions during the time of apple bloom in Central Missouri and adjoining territory. Most of the days were cold and rainy and utterly unsuited for the flight of insects. Almost equally bad pollination weather prevailed this past season (1930), when a sudden very hot and dry spell brought out all flowers almost overnight and the blooming period was extremely short. Because of this fact, many flowers remained unpollinated. In years of such unusually bad weather, when the favorable period of pollination is very brief, large numbers of honey bees are necessary to accomplish the task of pollen distribution in a short time. They become very indispensable as agents of pollination of our orchards.

In such years other insects likewise may be of great service, but they are usually present in too small numbers to be of any appreciable value. Many of them, however, especially wild and bumble bees, fly at a lower temperature and in stronger wind than the honey bees do. It is said that the Carniolan bees visit flowers on considerably colder days than our common Italian or black bees. If this is true, then in the future it may be possible either by selection or by breeding to secure domesticated bees that, being good honey producers, would be even more desirable as pollenizers of fruit trees. In the meanwhile, however, let us put to good use those that are available.

Obtaining Bees For Pollination

When there are no apiaries in the vicinity and bees are to be secured, the grower should either own them himself or rent them for the pollination period from a reliable beekeeper. Keeping bees successfully the year round requires a good deal of technical knowledge and considerable experience. They demand careful attention during certain times of the year. If this is not provided for, the colonies will become infested with disease, or will die out for various other reasons. The more efficient the fruit grower is, the less time usually he will have for attending to bees. He will find it more economical to obtain the desired number of colonies from some one who has made a specialty of beekeeping.

The renting of bees for pollination purposes has become a rather popular practice in some fruit growing sections. Many orchardists in Missouri have secured colonies in this manner during the past year or two. A great deal of work is involved in the moving of bees into an orchard, in their distribution and their removal, especially when the distance

is considerable and roads are poor. This should be appreciated by the fruit grower. On the other hand, he must be also alert to the fact that it is not the hive itself that is of value, but the bees within the box. A good colony should contain at least five pounds of bees, or approximately 25,000. No hive is really of any great value for pollination purposes unless it contains six or seven frames of broods. Bees of strong colonies will start flying much more readily and in larger numbers under adverse weather conditions.

In many localities, bees may be rented for the blooming season at \$3.00 to \$5.00 per colony. One of six to ten brood frames is certainly worth a rental of \$5.00. The price, of course, depends upon many factors, such as distance to move, location of the orchard, and amount of detailed service to be performed by the owner of the bees. Some have charged as high as \$10.00 in localities where the demand has exceeded the supply and where attempts have been made to so handle the bees as to have full-strength colonies early in the spring. This seems to involve additional care and expense in bee management. Any stipulated price should be subject to a definite agreement as to the specific service that is to be rendered by the beekeeper. The orchardist, on his part, must assume certain responsibility, which should be definitely understood in regard to location of the hives, spraying schedule, etc.

An advance notice of at least four or five days should be given by the fruit grower as to the approximate time when the bees are to be moved into the orchard. This may be followed by a definite call, specifying the exact date when the colonies must be in the orchard. There is a great deal of uncertainty as to when the trees may be in full bloom, since so much depends upon the weather. It is very essential, however, that the bees arrive in time for effective pollination.

The number of colonies necessary depends on the size of the trees. One for every three or four acres in a young orchard may be quite sufficient, while in an old orchard in full bearing a minimum of one colony per acre may be necessary. They should not be put in one location, no matter how desirable that might be from other considerations, but distributed throughout the orchard, placing them 200 feet apart and on some sort of temporary but secure stands. Their proper scattering among the trees seems to be a very essential feature, as it will mean the maximum number of visits to flowers, especially in inclement weather, when bees fly but short distances. It will facilitate also the proper distribution of pollen and thereby assure cross-pollination.

To avoid any possible danger from poisoning, the colonies should be removed promptly before the calyx spray is applied. There is no point of keeping them in the orchard after the majority of petals have dropped from the flowers. Any late blooming varieties of apples or other fruits that may be present will have to be pollinated by stray insects, which by this time have increased in numbers. Poisoning of bees has been extensive in sections where dusting is quite commonly used. There seems to be very little danger of poisoning from

liquid sprays when the bees are handled judiciously and promptly.

Many fruit growers, particularly in Northern States, are purchasing package bees each spring from the South, where a special type of beekeeping has developed. The bees are sold by pound and shipped in wire-cloth cages by mail or preferably by express. To be of greatest value, a three-pound package with a queen should be ordered sometime during the winter for each acre of mature fruit trees. When properly notified (usually by wire) a reliable apiarist will make a prompt delivery. The cost has varied lately, but is about one dollar a pound for the bees and fifty cents to one dollar for the queen. The purchaser pays the express charges and assumes all responsibility at his end of delivery.

Unless the grower is planning to become an owner of bees, it may be advisable to arrange with some beekeeper for a temporary use of hives and the necessary equipment for handling of package bees. Their proper transfer and care also may be undertaken by the bee man, who is compensated by receiving the more or less established colonies at the end of the pollination time, after which they are of no particular value in the orchard. If the grower has this equipment on hand and undertakes himself to care for the package bees, then they may be used only during the time when fruit trees are in bloom or kept until the end of the summer and subsequently destroyed or disposed of in some other manner. A fresh supply is purchased each spring.

Beekeeping as a sideline to fruit growing may be ventured by some enterprising fruit growers, who may begin their apiaries by purchasing package bees and second-hand equipment or by securing fully developed and properly housed colonies. More difficult as this procedure is, it will provide the orchard with one's own pollenizers and thus facilitate a maximum set of fruit.

Report from 1929-1930 Report-Missouri State Horticultural Society.

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THE HONEY BEE AND THE FRUIT GROWER

By R. L. Parker, Kansas State Agricultural College, Manhattan, Kansas.

Some fruit growers are aware of the advantage of honey bees as pollination agents. Others are also aware of the activities of honey bees, but will give them no credit.

Insects are necessary for the pollination of nearly all of our fruits, since the pollen is sticky and heavy, and cannot be carried by other means. There is always the danger from self-fertilization of fruit bloom, because the majority of our cultivated varieties of fruits are self-sterile. Very good instances of the folly of planting large blocks of one variety of fruit have been shown by orchardists in the past. In Virginia, one commercial company planted one large block of many thousand acres of Bartlett pears. The company did not receive a crop of fruit from this large orchard in all of the years it was in bearing. They did receive, however, a few fruits on each tree each year. When they made replacements, they supposed they were putting in Bartletts, but it was shown at the time of producing that they were not Bartletts. After these replacements began to bloom, the Bartlett trees in the vicinity began to produce crops of fruit. The same thing has happened with apples in the State of Michigan, the variety being Northern Spy. This, I think, indicates the necessity of interplanting varieties and also the indispensable use of insects as a means of fertilizing the flowers.

There are other insects beside the honey bee which may carry on the pollination of fruits, but at the time of the blooming of our orchard fruits there are very few insects in the field, and since we have begun extensive cultivation of agricultural areas many of the beneficial insects have been disposed of. The only insect of value that can be depended upon year after year to carry on this pollination of fruits is the honey bee, since it is under the control of man.

There is another point in favor of the honey bee in that when it once starts to work in a certain kind of flower it is constant in all of its food-gathering activities. An illustration of this is, the honey bee that works on apple blossoms continues to work on them all the while the tree is in bloom. At the same time, dandelions may be in bloom, but the bee that is working on the apple confines its activities to the apple, just as the bee working on the dandelion remains constant to the dandelion. This, I think, points out the real value of the honey bee in pollination purposes for the fruit grower. In other words, the honey bee enables the fruit tree to set a crop of fruit, and thus the fruit grower obtains a larger production. If the orchardist is also the owner of the bees, then he has an income from the honey and wax produced by the bees, in addition to the fruit production of the orchard. The honey bee, in its cross-pollination work, increases the yield of the fruit as well as the quality. In other words, all of the seeds have been fertilized and in this way an even-sized and shaped fruit is the result (not not a dwarf, misshapen one).

The flower of a fruit tree consists of several parts, such as the sepals, petals, stamens, pistils, and ovary. The principal parts that are concerned in fertilization are the stamens, pistil, and ovary. The pistil is usually a stem-like structure near the center of the flower on which is located the stigma, the upper end of which is sticky. On the lower end of the pistil is located the ovary. On the ends of the stamens are little bodies which seem to be balanced there, known as anthers. These anthers usually are made up with two pockets and these contain the pollen grains. When the pollen is fully developed, or ripe, the anthers split and the pollen is taken up by some agent and placed upon the stigma of the pistil. As stated before, the honey bees are the usual agents for transferring pollen from the anther to the stigma. When the pollen grain rests upon the stigma it germinates and sends out what is known as a pollen tube down the stem of the pistil to the ovary. When this takes place the ovary or seed is fertilized. The tendency among plants is to prevent self-fertilization. This means that these plants are self-sterile. In other words, pollen from one particular flower or plant will not fertilize the flowers on the same plant. It seems that

when a plant under these conditions does produce fruit or seeds, there is a loss of vigor and hardiness in the new plant.

Nature has provided many methods to prevent this process of self-fertilization. As an illustration, I will cite the avocado. The blooming of the avocado takes place in two stages. The pistillate flowers on a particular plant may bloom in the morning, whereas the staminate flowers may bloom in the afternoon. By the time the staminate flowers have bloomed, the pistillate flowers are closed. This prevents self-fertilization in this particular plant. This also shows that where large blocks of one variety of avocados have been planted there has been no fruit crop, due to the lack of pollination of the flowers. It means, for pollination in this plant, there must be varieties adapted to each other so that the pistillate flower of one is in bloom at the same time as the staminate flower of another.

Since most cultivated fruits are self-sterile, in order to produce a fruit crop it is necessary that cross-pollination takes place. This means that several varieties of a certain fruit would have to be planted together to obtain the best results. Many horticultural investigators have shown that the more common of our cultivated fruits are self-sterile. Morris, investigating the self-sterility of apples in the State of Washington, states: "Self-sterility is more common among varieties of apples than is self-fertility." Lewis and Vincent, in their investigations, have shown that 25 out of 58 varieties of apples are self-sterile. We find that the Delicious apple is intersterile. Probably two of the best varieties of apples for pollination purposes are the Jonathan and Ben Davis.

Hendrickson, of California, has carried out extensive work with plums, particularly the European and Japanese types. Out of 26 varieties with which he has worked, he finds 20 of them self-sterile and 6 self-fertile. Waugh, who has worked with 55 varieties of our native plums, finds that nearly all of them are self-sterile.

Waite, investigating the fertility of pears in Virginia, finds that 12 of our most common varieties are self-sterile. Tufts and Phillips, working in California, find that all of the 22 varieties of sweet cherries with which they have worked are self-sterile. All of the peaches are self-fertile except the J. H. Hale peach. The majority of our strawberries and also cranberries are self-sterile.

The possible agents that might work in the process of cross-pollination of fruits are wind and insects. Because of the nature of fruit pollen, it being sticky and heavy, wind is not a factor. This leaves the insects as the intermediary living agents for the transferring of pollen. This has been demonstrated by the use of glass slides covered with vaseline placed in the vicinity of the apple trees. If these plants were wind pollinated, the glass slides should have been covered with pollen. Since they did not have any pollen on them, the indication is that wind is not a factor.

To show that the insect is the necessary agent, self-fertile trees have been caged within screen wire. Such trees have had a poor set of fruit, again showing that wind is not an agent. Uncaged trees under the same conditions produced the normal set of fruit.

Many experiments have been carried out by caging fruit trees and noting the difference in the production of fruit on the tree and within the cage, as against that on a tree without the cage. In all cases where insects were excluded there was a very poor set of fruit. The same conditions, where cages were used and honey bees placed within the cages, showed that there was little difference in the sets of fruit on the trees within or without the cage when two varieties were used.

As stated before, the honey bee is the only insect under the control of man and in great enough numbers at the time of the fruit bloom to be of value. I wish to point out some of the adaptations to aid the bee in its work. On the body of the honey bee are two kinds of hairs—those which are branched and unbranched. These catch and collect pollen grains from flowers and, of course, when they come in contact with flowers, deposit some of the grains. The honey bee uses pollen as a food; therefore it collects it in large quantities. Because of this fact, there is a special adaptation of structures on the hind legs of the bee for packing and carrying pollen. The carrying receptacle

is commonly known as the pollen basket of the honeybee. In this way the bee visits flowers, collecting pollen and distributing it at the same time. The honey bee, in its food-collecting activities, is constant, as mentioned above in this paper. Another point, and an important one to consider, is that this insect is under the control of man, and we can produce large numbers of bees which can work in the field at a certain desired time. This means that we have fairly large numbers—somewhere between 10,000 and 15,000 bees—carried over the winter and then after brood-rearing begins in the spring we will have from two to three cycles of brood in which can be produced many thousand more bees.

The bumblebee used to be a factor in pollination, since there were great numbers of them, but in this case only the queen was present, so the numbers were infinitely smaller than those in a colony of honey bees. The bumblebees are not constant in their work, since they visit many flowers on any one food-collecting trip. This is true with other near-related bees to the honey bee.

Other factors which influence the activities of insects are those of a meteorological nature. These factors can be spoken of very briefly as cold, wind, rain, and cloudiness. These are inhibiting factors. Favorable factors are warmth, little or no wind, and sunshine. The honey bee goes on independent of these conditions, since it is in a hive and maintains a certain brood-rearing temperature. Of course, weather conditions do influence the flight of the bee the same as other insects.

The superiority of the honey bee as a pollination agent is pointed out in the following:

1. Worker bees do not die in the fall as do other forms of insects in this same group. In the case of the bumblebees, all of the bees die except the young mated queens.
2. The honeybee winters in an active condition and does not hibernate. As a general rule, other insects go into a resting stage, or hibernate, and in this way are not in great numbers. Due to the fact that the honey bee goes through the winter in great numbers it is active at all times.
3. The honey bee is the only insect which can be easily distributed as desired in the orchard.
4. It is possible to increase the number of worker bees present in the colony by certain manipulations known to beekeepers.

If an orchardist is considering the use of bees in the orchard for pollination purposes, the work of management of honey bees is quite different from that of managing them for a honey flow, which comes at some later time. The object in view by the orchardist is to have great numbers of bees present at the time of fruit bloom. This means a strong colony. In order to produce a strong colony it must have plenty of food at all times in the way of honey. It should have protection during the winter and spring. A young, vigorous queen with plenty of bees should be present at the time the colony is being prepared for winter. Honey bees need water at all times during the period of brood rearing.

If the orchardist is planning to be the owner of the bees, then it is well to have some one who is skilled in the care of bees to take care of them, and to give this care at the right time and in the right way. If the orchardist plans to rent bees for pollination purposes, the general rule is that the apiarist cares for the bees for a certain fee per colony. The usual rent for colonies varies from \$3.00 to \$10.00 per colony, depending upon the strength of that colony. If a colony has only three frames of bees, it would be worth only \$3.00. If it has ten frames of bees and brood, it would be worth \$10.00.

The usual number of colonies of bees in an orchard for pollination work is one or two colonies per acre, or four or five colonies for every 200 yards. To assist in the pollination work it is a very good plan, if the block is one variety, to place bouquets of a good pollinating variety in different locations throughout the area. These bouquets may be made up by placing branches in buckets of water in the desired location.

As a general rule, in renting bees to the orchardist, he will wish to have them moved in in time to take care of his needs, which would

be just before or just at the time of blooming. The beekeeper will want to move the bees out of the orchard twenty-four to forty-eight hours previous to the time the first arsenical or calyx spray is placed on the blossoms. This is to take care of the condition which may arise if spraying operations are carried on while the bloom is at or past its peak. Many colonies of honey bees in the State of Washington, or the Northwest, have been killed by spray poisoning. This has also been true in the fruit districts in New York. This is the reason the beekeeper renting the bees to the orchardist wishes to move his bees out of the orchard at the time the first arsenical spray is applied, at the time of blooming or after blooming of the fruit.

Reprint from 1930 Biannual Report Kansas State Horticultural Society.

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Conn. Exp. Station Bulletin No. 315, April, 1930, page 571, says, "The Sulfocide and Scalecide treatment was very good, showing a higher percentage of good fruit in three of the four varieties used in these tests."

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A recent report of the New York (Geneva), Experiment Station compares Sunoco Spray with three other petroleum products in the control of Rosy Aphis of Apple.

In Table 6, of Bulletin No. 582, the relative value of the petroleum sprays appears as follows:

Plat No.	Treatment	No. of Trees	Total No. of apples	Average No. of apples per tree	Average No. Aphid apples per tree	Percentage of Aphid apples per tree
10	Sunoco Spray	9	13,176	1,464	109	7.45
9	Oil Emulsion No. 1	8	16,258	2,032	430	21.16
11	Oil Emulsion No. 2	8	10,303	1,288	366	28.42
11	Oil Emulsion No. 3	8	5,052	632	275	43.60

In addition to a "commercial control" of Rosy Aphis with Sunoco Spray, European Red Mite, Scale Insects and Apple Red Bug can be controlled with a single late delayed dormant spray.

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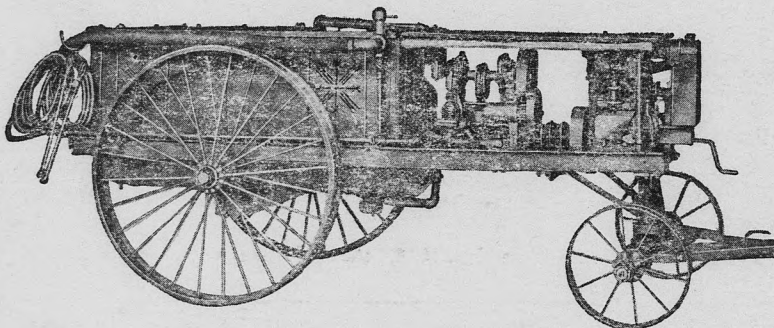
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